

## DIFFERENT OPERATOR USING IN EDGE DETECTION FOR IMAGE PROCESSING

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### ABSTRACT

In this paper represented method for edge detection and represent different operator using edge detection. In this paper the edge detection is use two technique gradient based technique and laplacian based technique. In the first section of the paper describe the introduction and the second section is describe of the paper is gradient operator and the third section is describe the laplacian operator. The gradient based techniques are as Robert Cross operator, sobel operator, prewitt operator. The Laplacian operator as Marr hildreth. We study the both types of operator.

**KEYWORDS:** Edge Detection, Gradient Operator, Laplacian Operator

### INTRODUCTION

The edge detection is in the vanguard of the image processing for object detection. It is essential to have good understanding of edge detection. This paper represent different types of operator is in use of image processing such as gradient based operator and laplacian based operator. The edge detection is in essential part of image processing, edge detection means a lack of connection in gray level value. Another point we can say that the edge detection is the fundamental operation is in a image processing. The edge means the boundaries between object and background [1]. There are two types of operator is in use image processing gradient operator and Laplacian operator. They are use in several applications [2]. Most of the shape information of an image is enclosed in edge so first we detect these edge in an image by using these filter, which contains edges, sharpness of the image will increased and image will become clear. This filter is a mask and the mask is use the concept of masking known as spatial filtering. It is known as filtering. The filter are applied an image for multiple purpose. The filter is used for blurring and noise reduction and is use for edge detection and sharpness. Operator can be use as horizontal, vertical, diagonal edges. The operator requirement to select the response of such as false detection, gradually changes and false detection and missing true edges and line and noise [3]. Their many way to perform the edge detection gradient based and laplacian based.

### EDGE DETECTION

Edge detection is the name for a set of mathematical method which aim at identifying points in a digital image at which the image brightness change sharply or more formally has discontinuities [4]. The purpose of detecting sharp changes in image brightness is to capture important event. It corresponds to discontinuities depth discontinuities in surface orientation, variation in scene illumination [5]. Once we have computed a measure of edge strength (typically the gradient magnitude), the next stage is to apply a threshold, to decide whether edges are present or not at an image point. The lower the threshold, the more edges will be detected, and the result will be increasingly susceptible to noise and detecting edges of irrelevant features in the image. Conversely a high threshold may miss subtle edges, or result in fragmented edge. The boundary is also called the border or contour of a region. It is the most used operation in image analysis. The edge defined the discontinuities in the gray level. This image shape in using edge is depends to different parameter. The edges are describing the intensity over a area of images. It can use many algorithms. The edge detection

can follow three types of operator. Such as edge fitting operators (as first derivative operator example sobel, prewitt etc second operator is the second derivative such as zero crossing operator example- laplacian, and third is the enhancement & thresolding.

### Various Approach for Edge Detection

The various approaches for edge detection are used to detect the edge. Such as two grouped as a gradient based approach and Laplacian based approaches. The Gradient based approach are use detect the edge are First derivatives methods. It are detect the edges by looking the maximum and minimum in the first derivatives. The laplacian based method search for zero crossing in the second derivatives of the image.

### Motivation Point for Edge Detection

The motivation point for edge detection is described the following term.

- The depth discontinuities
- The surface discontinuities
- The intensity discontinuities
- The variation in illumination

### GRADIENT OPERATOR

The gradient are finding edge strength and direction at location (x, y) of an image f, is the gradient denoted by Delta . This vector has the important geometrical property that it points in the direction of the greatest rate of change of fat location (x, y).

$$\nabla f = \begin{bmatrix} G_x \\ G_y \end{bmatrix} = \begin{bmatrix} \partial f / \partial x \\ \partial f / \partial y \end{bmatrix}$$

The magnitude (length) of a vector is denoted by,

$$|\nabla f| = \sqrt{G_x^2 + G_y^2}$$

Where is the value of the rate of a change in the direction of the gradient vector gx, gy? The direction of the gradient vector is given by the angle measured with respect to the x-axis.

$$\alpha(x, y) = \tan^{-1} \left( \frac{G_y}{G_x} \right)$$

The direction of an edge at an arbitrary point (x, y) is orthogonal to the direction,  $\alpha(x, y)$ , of the gradient vector at the point.

### Some Gradient Operator

- Sobel operator
- Prewitt operator
- Robinson mask

- Kirsch compass mask

### Sobel Operator

It is very similar to prewitt operator .It is also a derivative mask and is used for edge detection .It also calculate edge detection for horizontal and vertical. It have better noise suppression.

**Table 1: Horizontal Mask**

-1	-2	-1
0	0	0
1	2	1

**Table 2: Vertical Mask**

-1	0	1
-2	0	2
-1	0	1

### Prewitt Operator

It is used for edge detection than detect two types of edge 1)Horizontal2) Vertical .The edge are calculated by using difference between corresponds pixels intensities of an image All the mask that are used for edge detection are also known derivative mask and this operator is called derivative operator

**Table 3: Horizontal Mask**

-1	-1	-1
0	0	0
1	1	1

### Robinson Masks

This operator is also known as directional mask. In this operator we take one mask and rotate it in all the 8 compass major direction to calculate edges of each direction.

**Table 4: Horizontal Mask**

+1	0
0	-1

**Table 5: Vertical Operator**

0	+1
-1	0

### Kirsch Operator

It is also a derivative mask. This is used for finding edges. This is used for finding edges kirsch mask it also used for calculating edges in all directions.

### LAPLACIAN OPERATOR

LAPLACIAN operator is a second derivative for linear operation. The second derivatives are used for image sharpening. This approach basically consists of defining a discrete formulation of the second order derivatives and filter mask based on that formulation. We are interested in isotropic filters whose response is independent of the direction of the discontinuities in the image to which filter is applied [6]. It is search for zero crossing of the laplacian in the neighborhood of local maxima of the gradient.

### Properties of Laplacian Operator

- It is closer to mechanism for visual perception.

- Laplacian operator use only one parameter.
- There is no required threshold.
- There is no information about on the contour orientation.
- It is more sensitive to noise because it usage of second derivatives.

The Laplacian  $L(x, y)$  of an image with pixel intensity is given by

$$L(x,y) = \frac{\partial^2 I}{\partial x^2} + \frac{\partial^2 I}{\partial y^2}$$

Kernels are used to approximation by second derivatives measures on the image. They are very sensitive to noise.

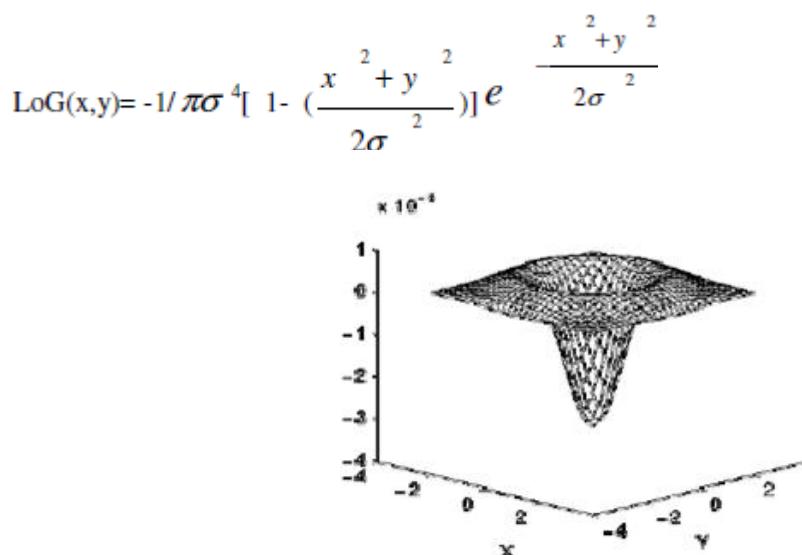
**Table 6: Filter Mask is Used**

1	1	1
1	-8	1
1	1	1

-1	2	-1
2	-4	2
-1	2	-1

### MARR- HILDRETH

This operator used for edge detection should have two features .It should be a differential operator capable of computing a digital approximation of the first and second derivatives at the every point in the image. They second it should be capable of being “tuned” to act at any desired scale, so that large operators can be used to detect blurry edges and small operator to detect sharply focused fine details. The Gaussian and laplacian are usually much smaller than the image.



**Figure 1**

### TESTING OF DIFFERENT TYPES OF OPERATOR



**Figure 2**

This figure is indicate the different types of operator is using and this figure is show that the sobel operator is best .sobel is major edges is detect and than prewitt operator and Robert operator.

## CONCLUSIONS

We study the different types of operator. The study the gradient based operator and laplacian based operator. This paper concludes the Sobel filter is a best than the other mask. Sobel operators have better noise suppression (smoothing) characteristics makes.

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## AUTHOR'S DETAILS



